high antidotal properties. If dried, an antivenomous serum retains its neutralising power for a long period, and it possesses this great advantage over a mere chemical antidote, that it can also antagonise venom which has been absorbed, and may thus be of service for a longer time after injection of the venom.

*Bathy-orographical Map of Africa.* 1–8,400,000. *Bathy-orographical Map of Asia.* 1–9,300,000. (Edinburgh: W. and A. K. Johnston, Ltd.) Price 12*s.* each.

WE must congratulate Messrs. W. and A. K. Johnston on these excellent additions to their series of orographical maps. The elevations in Africa show 10,000, 5000, 2000, and 1000 feet and below sea-level. The general effect is satisfactory, though the very deep green is, we think, somewhat unpleasing. The 10,000-feet contour shows the higher elevations of the Atlas, Abyssinia, the Lakes Plateau and the Drakensbergen, but the tint is indistinguishable by a class. It would, however, have probably made the map more useful if the 8000-feet line had been selected, as the highest points are not of great importance for an educational map except in the region of the great lakes. As it is, the mountainous areas do not indicate their special character.

The other contours selected show the formation of Africa well. The sea depths shown are 100, 1000, 2000, and 3000 fathoms. It is to be regretted that the same contours have not been chosen to represent both the land and sea, as the plateau character of Africa would have been brought out with much greater effect.

Both in Africa and Asia, physical names have been very fully shown. As they cannot be read by a class, it is a pity that they have not been printed faintly in blue, like the initial letters of towns. The mass of black lettering largely spoils the graphic character of the maps.

Actual mistakes are few, though one may be noted—in the north-east of Abyssinia the area below sea-level has been coloured as more than 1000 feet.

The map of Asia is more effective than that of Africa, possibly owing to the selection of the contours. The 10,000-feet affords a means of comparison with Africa, but it should, if possible, have been printed the same depth; then the 15,000- and 20,000-feet lines would, with suitable graduation, have illustrated the character of the Tibet Plateau. At present minute and close examination is necessary to distinguish the features of the North-West Frontier. The lower elevations are much better shown. The 100, 3000, and 6000 feet bring out well the great river valleys and depressions of Asia.

In spite of these defects, the maps are likely to prove more useful for schools than any that have previously been published of these continents.

*Publications of the Research Defence Society.* March, 1908, to March, 1909. Selected by the Committee. Pp. xv+216. (London: Macmillan and Co., Ltd., 1909.) Price 2*s.* 6*d.* net.

THE Research Defence Society was founded on January 27, 1908, "to make known the facts as to experiments on animals in this country; the immense importance to the welfare of mankind of such experiments; and the great saving of human life and health directly attributable to them." The president is the Earl of Cromer, himself a champion in the cause of kindness to animals; the committee is a strong one, its members representing all branches of science, and also including many theologians and laymen, and in March of this year the membership of the Society numbered more than 2250.

This first volume of publications contains the president's address at the inaugural meeting, a review of the Home Office Report for 1907 on, and some facts as to the administration of the Act regulating, experiments on animals, and several essays (also published separately in pamphlet form) by well-known experts dealing with the knowledge that has been derived from experiments on animals, and the saving of human life therefrom. Prof. Cushny shows that the nature of the action and therapeutic use of all drugs of recent introduction, and the potency of the preparations of many of the older drugs (*e.g.* digitalis and ergot), have been elucidated solely by experiments on animals, the value of diphtheria antitoxin and of serum treatment in epidemic cerebro-spinal meningitis (spotted fever) is discussed by Dr. Courtauld and Dr. Robb respectively, Sir David Bruce writes on the extinction of Malta fever, and Dr. Bashford's article in NATURE on recent advances in knowledge of cancer is reprinted. The evidence of Lord Justice Fletcher Moulton before the Royal Commission on Vivisection is given *in extenso*, and is a powerful vindication from the ethical side of the right to employ experiments on animals for the benefit of mankind.

If the standard of its publications be maintained at the level of those contained in this volume, the Society will be doing excellent work in the cause of experimental research. R. T. H.

*Milk Testing. A Simple Practical Handbook for Dairy Farmers, Estate Agents, Creamery Managers, Milk Distributors, and Consumers.* By C. W. Walker-Tisdale. (Northallerton: W. R. Smithson.) Price 1*s.* net.

THE author of this little book is already favourably known by his early publications, jointly with Mr. T. R. Robinson, on butter-making and soft cheese-making. He holds an important position in the dairy world, and, as general manager of the Wensleydale Pure Milk Society, knows at first hand all the difficulties that beset the dairyman. The result is an admirable little volume, sound in regard to analytical methods, and direct in its appeal to the man for whom it is intended. It is more than a mere collection of methods, and includes discussions of such cognate subjects as the use of preservatives. Occasionally a request is heard in certain quarters that a preservative should be allowed in milk, but our author will have none of it, and advises the dairyman to keep clear of them all, even of a certain preservative offered for sale, "guaranteed to contain no boron or boric acid, and claimed to be undetectable by chemical analysis"! Quite apart from considerations of the general health of the community, the author shows that the dairyman himself would suffer, since foreign milk would invariably be imported if preservatives were allowed. E. J. R.

*The Journal of the Cooper Research Laboratory.* Edited by Walter E. Collinge, Director. (Berkhamsted: The Cooper Research Laboratory, 1909.)

THE fact that the principal of a large and well-known firm like Messrs. Cooper should start a research laboratory and publish a journal is a satisfactory proof of the widespread interest now being taken in science by all who have to do with agricultural and horticultural matters. The special province of the firm—treatment of insect and fungoid pests—certainly borders more closely than usual on pure science, and no doubt a trained staff would have been wanted in any case. But here we have something more. The laboratory, we are told, "is in no sense a financial venture or business concern." Its functions are to answer inquiries from farmers, fruit-growers, and gardeners as to preventive and remedial treatment for diseases of plants and parasitic diseases

of animals, to investigate life-histories of various insects, parasites, &c., and generally to advise on subjects relating to economic biology, agricultural chemistry, and bacteriology.

The articles in the journal are mainly summaries of work done elsewhere rather than accounts of original work; perhaps this was only to be expected from an almost new laboratory. Mr. Collinge deals with the use of lime, with special reference to its influence on plant diseases like potato-scab and finger-and-toe fungus; he has also collected a good deal of scattered work on the woolly aphis. Mr. Barlow deals on similar lines with the effect on plants of copper salts used as fungicides. The summaries themselves call for no special comment, but the journal as a whole is well got up. We shall be interested to see how Sir Richard Cooper's experiment works—whether the laboratory can maintain the detached position essential for the publication of scientific work, or whether, as has happened elsewhere, it becomes merged in the purely commercial side.

*Cambridge County Geographies: Somerset.* By Francis A. Knight, assisted by Louie M. (Knight) Dutton. Pp. xi+192. (Cambridge: University Press, 1909.) Price 1*s.* 6*d.*

THE characteristics of the series to which this volume belongs were enumerated in our issue for May 13 (vol. lxxx., p. 305), and much of what was written on that occasion applies to the present book. The authors' interpretation of the scope of geography is wide enough to include a history of the county, its antiquities—ecclesiastical, military, and domestic—its administration and roll of honour. Like previous volumes in the series it is well illustrated, brightly written, and generally attractive.

## LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

### Difference between Longitudinal and Transversal Zeeman Effects in Helium Lines.

IT is easily shown on the theory of electrons that the amount of separation of the outer components of a transversal Zeeman triplet must be slightly different from that in a longitudinal doublet. Some time ago I showed that the transversal separation in weak magnetic fields does not strictly follow the linear relation with the magnetising force, but, owing to an indirect method of measurement, the exact amount of the separation could not be measured with accuracy. By measuring the longitudinal effect of helium lines with an echelon spectroscope of thirty-five plates, each of 1 cm. thickness, made by Hilger, I found that doublets can be distinctly separated in a field of 180 gauss, when the right- and left-handed circularly polarised light is linearly polarised in mutually perpendicular directions, by interposing Fresnel's rhomb in the course of the beam. Taking a number of points at intervals of about 300 gauss from H=0 to H=2000, and ten to thirteen points from H=2000 to H=14,000, I found that for the three lines λλ=6678, 5876, 5016, the relation between the amount of separation δλ and the strength of the field H is exactly linear, so that δλ/H=constant also in weak fields. In these experiments it was necessary to gauge the strength of the field accurately for each point before and after each micrometric measurement by means of a small coil. The values of $e/m$ were found to be for

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|---|---|
| λ=6678 | $e/m=1{\cdot}86\times10^7$ |
| =5876 ($D_3$) | $=1{\cdot}68\times10^7$ |
| =5016 | $=1{\cdot}80\times10^7$ |

The separation of the satellite of $D_3$ is complex, but there is one component which gives the same value of $e/m$ as $D_3$.

With the transversal effect the ratio δλ/H is not constant in weak fields. With $D_3$, the curve representing the relation between H and δλ is such that it increases very slowly to H=800, then rapidly to an inflexion point in H=1700, makes a bend, and from H=2000 follows an accurately straight course up to H=14,000, which is the strongest field used in the present experiment. In the latter part of the curve $d(\delta\lambda)/dH$=constant, which is smaller for the transversal than for the longitudinal effect, so that the curves representing these effects cross each other in H=1200 and H=10,900. The initial part of the curve for the transversal effect shows a striking resemblance to that of magnetisation in ferromagnetic substances. The satellite accompanying $D_3$ shows remarkably complex separation, as shown by Lohmann, but there are two components which take a similar course to the principal line $D_3$. The lines are already separated before reaching the inflexion point above mentioned, so that the method which I used in my former experiments, is confined only to weak fields. With the line 6678, the initial course of the curve for transversal effect is similar to that of $D_3$, but the inflexion point is reached in a higher field H=2700, and the curve becomes a straight line from H=3600 upwards. The curve for longitudinal effect lies entirely above that for the transversal, and $d(\delta\lambda)/dH$ in strong fields is greater for the former than for the latter.

The usual calculation of $e/m$ is made on the supposition that δλ/H=constant, which is strictly obeyed in the longitudinal, but not in the transversal, effect; the discrepancy in the value of $e/m$ calculated from longitudinal and transversal effects is at once explained. The initial course of the curve can be accounted for by Voigt's theory, but the appearance of the inflexion point before attaining the straight course presents some difficulty. The resemblance of the curve of transversal effect to that of magnetisation seems to have an important bearing on the exposition of the theory, which would explain these characteristic features. The extension of these experiments to stronger fields and with different elements is being undertaken.

H. NAGAOKA.

Physical Institute, University of Tokyo, July 16.

### Natural Selection and Plant Evolution.

THE letter from Mr. James B. Johnston in NATURE of August 5 touches on many important points, which cannot be fully dealt with in a letter of reasonable length.

In his opening sentence the writer, speaking of chapter xii. in "Darwin and Modern Science," says that "there, perhaps for the first time, the evidence of the fossils with regard to the influence of natural selection has been fairly tackled"; I may point out that the chapter cited really relates mainly to evolution, and especially phylogeny; only the last section refers to natural selection, a subject on which, from the nature of the case, the fossil record can throw comparatively little light.

I cannot think that, on the main question, there can be any very fundamental difference between the writer's views and my own, for he says:—"In the case of the Tertiary mammals the action of natural selection can be very clearly demonstrated in numberless cases." Mr. Johnston cannot seriously mean that he accepts natural selection for animals and rejects it for plants. The question is simply one of evidence. As I have myself pointed out, the direct evidence for the derivation of one species from another is at present less satisfactory in the plant than in the animal record ("Darwin and Modern Science," p. 204); on this point we may hope for new light from further research, though, as regards the efficacy of natural selection (an essentially different question), I doubt if palæontological evidence will ever be really decisive.

My point in speaking of the evolution of the pollen-tube and seed was to show that such characters are *adaptive*, a view to which Mr. Johnston is not likely to object. In the present position of biological science evidence of adaptation is commonly accepted as presumptive evidence of the action of natural selection.

The question whether a belief in the efficacy of natural selection can be regarded as "barring out all design from the world in which we live" is not one that can be dis-